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ABSTRACT

The usefulness of Biglan's model of academic disciplines for examining how Yale University departments differ in their evaluations of undergraduate performance is studied. Biglan's 3-way model classifies departments according to (1) the degree to which they have a paradigm (hard vs. soft), (2) their concern with life systems as objects of study (life vs. nonlife), and (3) their emphasis on application (pure vs. applied). The present study, undertaken at Yale University, finds that the hard-soft classification most clearly differentiates how faculty evaluate student performance, showing significant differences for descriptions of real, successful students, for ideal use of 21 varied dimensions of student performance to evaluate success, and for ideal use of these dimensions to evaluate nonsuccess. Life and nonlife departments also differ significantly in their use of the 21 performance dimensions to describe successful undergraduates. The aspects of student performance that are stressed by the different faculty groupings of hard and soft, and of life and nonlife disciplines are also explored. (Author/MSE)

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How Academic Departments Differ in Their Evaluations of Student Success

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This paper was presented at the Annual Meeting of the Association for the Study of Higher Education held at the Washington Hilton in Washington, D.C. April 18-19, 1979. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

How Academic Departments Differ in Their Evaluations of Student Success

Perhaps more than most organizations, colleges and universities are evaluating organisms. College faculty constantly are evaluating their primary "products"--the students whom they teach. The visible signs of these assessments are the grades meted out during a school term and then officially sealed at term's end with a course grade. But the evaluating behavior of college teachers goes far beyond tangible grades as our previous research has shown (Taber & Hackman, 1976). Faculty use a variety of academic criteria in addition to grades when they measure the success of a student, and a host of nonacademic criteria also are considered.

In this paper we will look at how academic departments differ in their evaluations of undergraduates. To classify departments, we will use Biglan's 3-way model of academic disciplines that groups departments according to (1) the degree to which they have a paradigm (hard--soft); (2) their concern with life systems as objects of study (life--nonlife); and (3) their emphasis on application (pure--applied) (1973a). The aim of our analyses will be to re-test the validity of Biglan's model and to examine its usefulness as a conceptual framework for research on academic departments.

Previous research has demonstrated that departments differ in a number of ways (Gamson, 1966; Lodahl & Gordon, 1973; Vreeland & Bidwell, 1966). Biglan (1973b) and Smart and Elton (1975) found that academic departments classifed by Biglan's model differ in departmental goals, task commitments, social connectedness, and scholarly output. Our hypothesis proposes that the differences found among Biglan's academic clusters will extend to the values that faculty hold about student success and failure.

To test this hypothesis, we will examine whether the 6 academic clusters differ on the following aspects of student evaluation:[1]

--Real use of performance dimensions. Do the departmental groups differ in their descriptions of students whom they consider particularly successful? those considered unsuccessful?

--Ideal use of performance dimensions. Do they differ in the ways that they would ideally use performance dimensions to evaluate undergraduates, provided that they had enough information about all aspects of student performance?

Method

This paper draws on data from the College Criteria Study, a research project that looked at the multiple criteria used by a total academic community (Yale University) to evaluate the success and nonsuccess of its undergraduates.

Procedures

Data gathering procedures are described in detail in Taber and Hackman (1976). Respondents were asked in an interview setting to nominate, from the Classes of 1973 to 1977, two undergraduates whom they considered "most successful" and two considered "least successful" students. They then described each of their four nominees simultaneously on the College Criteria Questionnaire (CCQ). The CCQ is a behaviorally anchored rating instrument, developed in pilot research, that includes 67 comprehensive categories used by this academic community to assess student performance. Factor analyses identified 21 dimensions that more succinctly describe the 67 categories (Taber & Hackman, 1976).

Sample

For the College Criteria Study, 434 students, faculty, and others were contacted, of whom 377 (85%) completed the CCQ. The analyses for the proposed paper come from the 116 faculty members who participated in the study. They were selected randomly from the Yale faculty, stratified by academic division and tenure status.

[1] As the chart on page 3 illustrates, two of the eight faculty clusters are not present in the Yale Faculty of Arts and Sciences.

Variables

The independent variable is academic department classified into 6 departmental groups following Biglan's 3-way model. The departments represented by our 116 faculty respondents are described in the following chart:

Academic Departments[1]

	SOFT		HARD	
	NONLIFE	LIFE	NONLIFE	LIFE
APPLIED	Economics Administrative Sciences (Operations Research)	[Education--not present at Yale]	Engineering & Applied Science Statistics Computer Science	[Agriculture--not present at Yale]
PURE	Humanities	Other Social Sciences	Other Physical Sciences	Biological Sciences

The dependent variables are descriptions of real students on the 21 dimensions of college performance and ratings of ideal use of the 21 for evaluating student success and nonsuccess. Dimension scores were formed by averaging ratings across those CCQ category items best defining each dimension. The 21 dimensions are listed below:

College Performance Dimensions

ACADEMIC

Intellectual Growth
Cognitive Proficiency
Communication Proficiency
Intellectual Perspective & Curiosity
Creative Performance
Academic Effort & Achievement
Self-Directed Behavior
Career Goals
Mathematical Proficiency
Foreign Language Proficiency
Artistic Performance

PERSONAL

Personal Growth
Optimistic, Emotionally Stable Behavior
Ethical Behavior
Athletic Performance

INTERPERSONAL

Organizational Participation
Interpersonal Sociability
Interpersonal Responsiveness
Discrimination Issues Behavior

INSTITUTIONAL

Persistence toward Graduation
Congruence with the College

[1]Humanities departments in the sample include: American Studies, Classics, English, History, Music, Philosophy, Religious Studies, Romance Languages & Literatures, Germanic Languages & Literatures, and Near Eastern Languages & Literatures. Other social sciences include: Anthropology, Political Science, Psychology, Linguistics, and Sociology. Other physical sciences include: Astronomy, Chemistry, Geology & Geophysics, Mathematics, and Physics. Biological sciences include: Biology and Molecular Biophysics & Biochemistry.

Analyses

Faculty descriptions of real use and ideal use of the 21 performance dimensions were compared for the 6 departmental groups using multiple discriminant analysis. To characterize the statistically significant discriminant variates which were found, correlations were computed between the faculty members' use of the 21 performance dimensions and their scores on the related significant discriminant variates (Dunham & Kravitz, 1976). To further explain the significant variates, we computed means and t-tests on the performance dimensions for the groups high and low on each departmental axis (hard--soft, life--nonlife).

Results

Real Use of the Performance Dimensions

Do the 6 departmental groups differ in their real use of the 21 performance dimensions? In their evaluations of successful undergraduates, the departmental groups differ significantly. They do not, however, have statistically significant differences in their descriptions of unsuccessful students.

Two significant discriminant functions ($p<.001$, .05) were found for the success descriptions on the performance dimensions, with the first function accounting for 60% of the variance. Table 1 reports results of the discriminant analysis for successful student descriptions and also gives the largest correlations of the dimension ratings with discriminant variates, in order of magnitude. Centroids of the 6 groups on the two significant variates are presented in Figure 1. Classification based on the discriminant functions is correct for 66.94% of the faculty members. The soft-nonlife-pure (humanities) and soft-life-pure (social science) faculty were most accurately classified, with the soft-nonlife-applied (primarily economics) and hard-nonlife-pure (physical sciences) faculty having the most misclassifications.

From the placement of the 6 academic department clusters on the two significant variates (Figure 1), it appears that Biglan's hard--soft dimension is represented by the horizontal axis, variate I, and Biglan's life--nonlife dimension by the vertical axis, variate II. One departmental cluster initially seems out of place. Biglan's empirical research classified economics departments in the soft-nonlife-applied cell whereas our SNA group (about 2/3 economics faculty and 1/3 operations researchers) is centered among the hard disciplines. This placement agrees with the neoclassical emphasis of the Yale economics departments which, unlike the other "soft" departments, follows a paradigm (i.e. has a commonly agreed upon set of problems for study and approved methods to be used in their exploration). The operations research faculty also fit this description.

Variate I. If we interpret the SNA group as more hard than soft, the soft disciplines--humanities and social sciences-- fall on the negative end of variate I and the hard disciplines--sciences, economics, and operations research--are located near the positive pole. Additional information for interpreting the variates is found in Tables 1 and 2. Table 1 gives the statistically significant correlations between dimension ratings and the variates and Table 2 gives means and F-tests on the dimension ratings between the hard--soft faculty and between the life--nonlife faculty. For these statistics, the SNA group has been classified as hard.

As one would expect, the same performance dimensions correlate highly with the hard--soft discriminant variate and show statistically significant differences between the hard and soft faculty on F-tests. Although both hard and soft faculty may give similarly high ratings to successful students on most of the performance dimensions, there are still significant differences between the two groups on certain dimensions. Mathematical performance is the dimension that clearly receives more emphasis from the hard departments. The soft departments give significantly higher ratings for the following

dimensions, in order of magnitude: foreign language proficiency, intellectual growth, personal growth, communication proficiency. Although F-tests were not quite significant, the following additional dimensions showed significant correlations with variate I at .05 or better: artistic performance, interpersonal responsiveness, participation in organizations, and congruence with the college (correlated highly with the soft end of the variate) and athletic performance (with the hard end of the variate).

Variate II. The social science departmental cluster clearly falls at the life, or positive, end of the vertical axis in Figure 1, and the nonlife clusters of humanities, economics & operations research, physical sciences, and the hard-nonlife-applied departments are toward the negative pole. Although the biological sciences are placed somewhat more positively than the physical sciences on this second variate, and much more positively than either humanities or economics, the social sciences are far more positive in placement.

Again, we can characterize the two ends of the axis by examining correlations with the performance dimension ratings and F-tests of the life and nonlife means on the dimensions. The nonlife pole of variate II is correlated highly with artistic performance and the means of the life--nonlife departments are also statistically different ($p < .05$). Significant correlations ($p < .05$) are also found for creative performance, communication proficiency, and discrimination issues behavior. For the life end of variate II, the following performance dimensions show both statistically high correlations and significant t-tests: interpersonal responsiveness, career goals, congruence with the college, and persistence toward graduation. Additional significant correlations ($p < .05$) are found for academic effort and achievement, interpersonal sociability, athletic performance, and intellectual perspective and curiosity.

Ideal Use of the Performance Dimensions

Do the 6 departmental groups differ in their ideal use of the 21 perfor-

mance dimensions? The soft and hard departments say that they would use the dimensions differently, if they had full information about a student whom they were evaluating. The different values that these two departmental groups place on the dimensions are shown in the one significant discriminant function found for evaluating successful students and again for evaluating unsuccessful ones ($p < .05$). Results of the discriminant analyses are given in Table 3, along with correlations of the dimensions with the significant variate for each analysis. The placements of the 6 departmental clusters on variate I in each analysis are shown in Figures 2 and 3. Over half of the variance is accounted for by each variate I. Table 4 shows means and t-test results between hard and soft faculty for evaluating student success and student nonsuccess.

The hard and soft departments are divided in ideal use very much as they differ on descriptions of real students. Mathematical performance continues to be much more important to the economists, physical scientists, biological scientists, and engineering and statistics faculty than to the social scientists and humanities faculty. The hard departments also value creative performance more than the soft departments when ideal use is considered. Once again, the soft departments see foreign language proficiency as significantly more important for student success than do the hard faculty, although neither rates the skill extremely high. Personal growth, intellectual growth, communication proficiency, artistic performance, and congruence with the college are also considered more important by the soft faculty--both for ideal use and for real use.

Discussion

Our findings generally support the usefulness of Biglan's model as a framework for examining how academic departments differ in their evaluations of undergraduate performance. Biglan's 3-way model classifies departments according to (1) the degree to which they have a paradigm (hard vs. soft), (2) their concern with life systems as objects of study (life vs. nonlife), and (3) their emphasis on application (pure vs. applied). The present research has studied whether the model clarifies real use and ideal use of 21 dimensions of college performance as used by faculty to evaluate undergraduate success and nonsuccess.

The hard--soft classification most clearly differentiates how faculty evaluate student performance. In three of four analyses, the first significant discriminant function polarized the hard and soft academic groups, and accounted for over 50% of the variance in use of 21 student performance dimensions. This held for real success use (descriptive ratings of real students nominated by the faculty as most successful), for ideal success use (how much faculty would ideally use each of the 21 dimensions for determining success, given full information), and for ideal nonsuccess use (how much faculty would use each dimension ideally for determining nonsuccess). The hard and soft departments did not differ in their descriptions of real nonsuccess students. (There were no significant discriminant functions for real nonsuccess use.)

The life--nonlife classification formed a second, statistically significant discriminant function for differentiating faculty descriptions of real succesful students. No applied--pure classification appeared in our analyses, but this was not unexpected as few of the faculty fit the applied category.

We also were interested in which aspects of student performance would be emphasized by the various clusters of departments defined by Biglan's

model. For each of the three significant hard--soft analyses, we found that the hard departments stress mathematical proficiency more than the soft departments, and that the soft departments more strongly emphasize personal growth, intellectual growth, foreign language skills, and communication (writing and speaking) proficiency.

The hard--soft differences fit in with what evidence we can find about how teaching differs for hard and soft disciplines. Gamson (1966) found in her research that scholars in the social sciences followed a normative orientation that encompassed education of the whole student whereas physical scientists followed a more utilitarian orientation that placed cognitive effects as the primary goal of college education. The soft disciplines within our study, which include the social sciences, do emphasize a much wider range of performance than the hard fields. They particularly emphasize overall intellectual and personal development, whereas the hard departments are much more specific in their valuing of mathematical proficiency. It may well be that fields which do not have a clear paradigm must take a larger view of undergraduate education, because they have so little agreement about the specifics which they study. The hard disciplines, and this includes economics and operations research in our Yale study, are much clearer about the theories and the methods of their work, and they therefore can focus on specific tools needed to succeed.

Interpretation of the life--nonlife differences in describing successful students is more speculative. We will suggest, however, that the nonlife disciplines deal with more abstract content than the life disciplines, and their greater emphasis upon creative performance, artistic performance, and communication proficiency fit with this emphasis. The life departments, in contrast, place more value on such practical and human dimensions as interpersonal responsiveness, career goals, congruence with the college, and persistence toward graduation.

We close this paper with the invitation to readers to join with us in exploring further interpretations and explanations of our findings, and in identifying other research that may clarify what we consider to be a very interesting topic of study.

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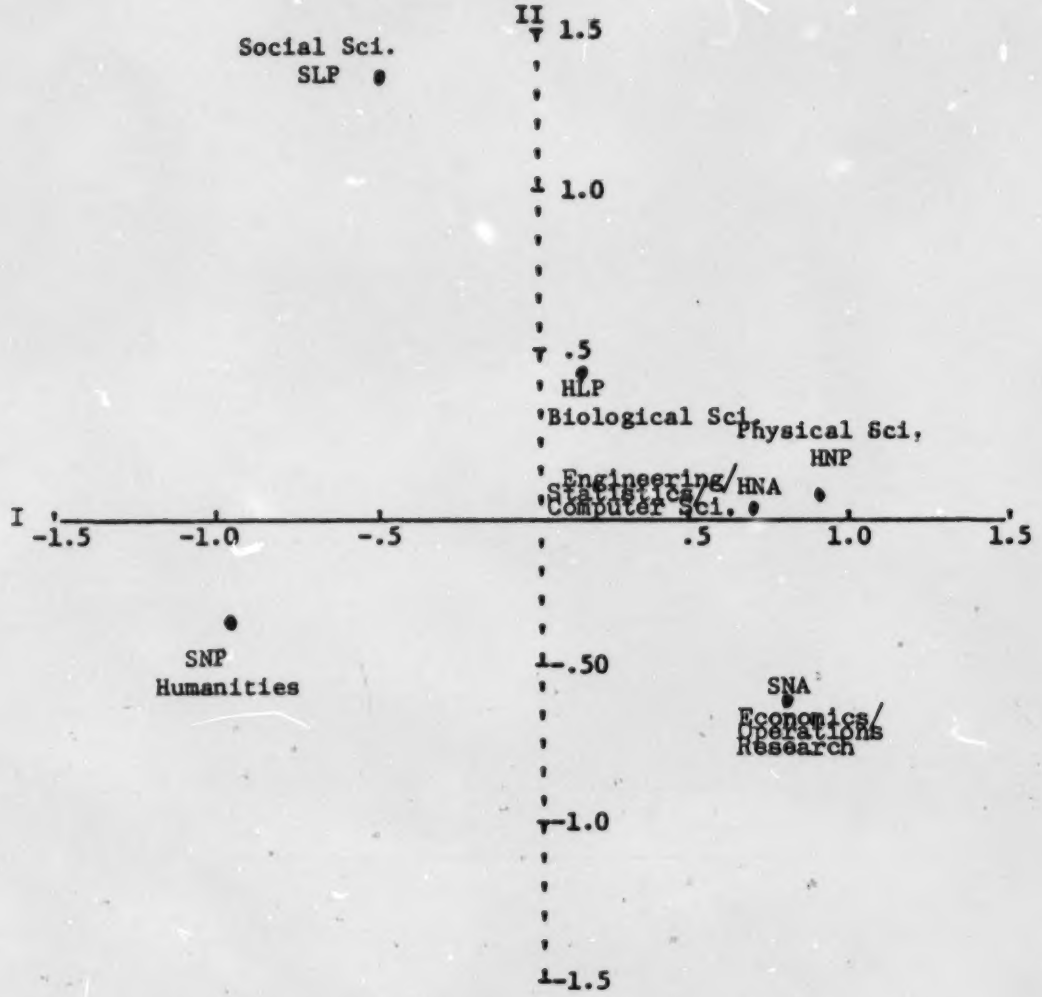
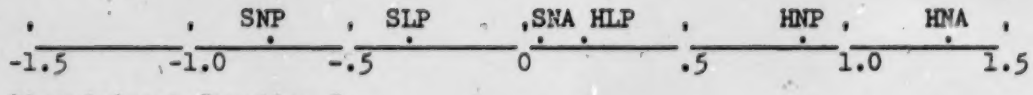


Figure 1

Centroids of Six Faculty Groups for Success Student Descriptions on Discriminant Functions I and II

Figure 2

Centroids of Six Faculty Groups* for the
Ideal Use of Criterion Dimensions
in Evaluating Student Success



*H=Hard
S=Soft
L=Life
N=Nonlife
P=Pure
A=Applied

Figure 3

Centroids of Six Faculty Groups* for the
Ideal Use of Criterion Dimensions

Table 1

Multiple Discriminant Analysis of Success Student Descriptions by Six Faculty Departmental Groups

Discriminant Function	Eigenvalue	Relative Percentage	Cancnical Correlation	Functions Derived	Wilks Lambda	Chi-Square	df
				0	.1330	214.832***	105
1	1.76725	59.96	.799	1	.3681	106.431*	80
2	.58412	19.82	.607	2	.5831	57.438	57
3	.25305	8.59	.449	3	.7307	33.413	36
4	.23296	7.90	.435	4	.9009	11.110	17
5	.10995	3.73	.315				

***=p.001
*=p.05

Largest Correlation Coefficients with First Two Discriminant Variates

	Variate I		Variate II	
Positive	Mathematical Proficiency	.73	Congruence with the College	.36
	Athletic Performance	.18	Career Goals	.33
			Interpersonal Responsiveness	.31
			Persistence toward Graduation	.25
			Acad. Effort & Achievement	.25
			Athletic Performance	.22
			Interpersonal Sociability	.21
			Intellectual Curiosity & Per.	.17
	Foreign Language Profic'ncy	-.45	Artistic Performance	-.45
	Personal Growth	-.35	Creative Performance	-.23
	Intellectual Growth	-.33	Communication Proficiency	-.18
	Communication Proficiency	-.27	Discrimination Issues Beh'r	-.16
	Artistics Performance	-.24		
	Organizational Particpatih	-.15		
	Congruence with the College	-.15		

Table 2

Real Use of Criterion Dimensions for Success Student Descriptions: Means and F-Tests for Soft versus Hard and Nonlife versus Life Departments[1]

	Soft $\bar{X}$ n=53	Hard $\bar{X}$ n=68	F-Value	Nonlife $\bar{X}$ n=91	Life $\bar{X}$ n=30	F-Value	Inter-Action F-Value
General Academic Dimensions							
Intellectual Growth	5.70	5.20	7.23**	5.38	5.55	.54	.24
Cognitive Proficiency	6.09	5.91	1.79	5.96	6.06	.37	.01
Communication Proficiency	5.66	5.26	6.01*	5.46	5.36	.35	.56
Intellectual Perspective and Curiosity	5.78	5.61	1.41	5.63	5.86	1.88	.59
Creative Performance	5.76	5.76	.00	5.83	5.53	1.92	.05
Academic Effort and Achievement	5.97	5.93	.09	5.88	6.15	3.18	1.16
Self-Directed Behavior	5.93	5.88	.15	5.90	5.89	.01	.63
Career Goals	5.54	5.77	1.88	5.54	6.08	6.70*	.39
Specific Academic Dimensions							
Mathematical Proficiency	4.57	5.86	58.78***	5.31	5.23	.03	2.12
Foreign Language Proficiency	4.85	4.23	16.40***	4.48	4.56	.12	2.10
Artistic Performance	4.77	4.51	2.99	4.73	4.31	5.87*	8.80**
Personal Dimensions							
Personal Growth	5.12	4.65	6.86**	4.77	5.11	2.51	6.48*
Optimistic, Emotionally Stable Behavior	5.45	5.50	.12	5.44	5.56	.47	.50
Ethical Behavior	5.72	5.58	.99	5.58	5.84	.07	.01
Athletic Performance	3.70	3.86	1.27	3.77	3.86	.32	2.62
Interpersonal Dimensions							
Participation in Organizations	5.45	5.50	.38	4.48	4.59	.39	2.14
Interpersonal Sociability	4.56	4.47	1.59	5.22	5.45	1.19	.18
Interpersonal Responsiveness	5.41	5.18	1.77	5.03	5.48	7.75**	.57
Discrimination Issues Behavior	5.25	5.05	1.50	4.47	4.56	.44	5.43*
Institutional Dimensions							
Congruence with the College	5.92	5.73	1.86	5.72	6.08	5.48*	.48
Persistence toward Graduation	5.98	6.00	.02	5.88	6.33	5.47*	.08

[1] On a scale from 1 through 7.

***p=<.00.
**p=<.01
*p=<.05

Table 3

Multiple Discriminant Analyses of Ideal Criterion Dimension Use by Six Faculty Departmental Groups[1]

	Discriminant Function	Eigenvalue	Relative Percentage	Canonical Correlations	Functions Derived	Wilks Lambda	Chi-Square	df
For Evaluating Student Success[2]					0	.2333	134.637*	105
	1	1.04775	55.93	.715	1	.4777	68.339	80
	2	.35834	19.13	.514	2	.6489	40.010	57
	3	.21044	11.23	.417	3	.7854	22.343	36
	4	.14088	7.52	.351	4	.8961	10.152	17
	5	.11600	6.19	.322				
For Evaluating Student Nonsuccess[3]					0	.2253	137.742*	105
	1	1.18967	59.57	.737	1	.4932	65.375	80
	2	.45541	22.80	.559	2	.7179	30.661	57
	3	.15090	7.56	.362	3	.8262	17.661	36
	4	.13095	6.56	.340	4	.9344	6.278	17
	5	.07023	3.52	.256				

*=p <.05

Largest Correlation Coefficients with Success & Nonsuccess Variates I

	Variate I--Success Evaluation		Variate I--Nonsuccess Evaluation	
Positive	Mathematical Proficiency	.60	Mathematical Proficiency	.56
	Athletic Performance	.27	Athletic Performance	.26
	Creative Performance	.28	Creative Performance	.26
	Career Goals	.25		
	Persistence toward Graduation	.16		
Negative	Foreign Language Profic'ncy	-.39	Foreign Language Profic'ncy	-.23
	Personal Growth	-.30	Personal Growth	-.38
	Intellectual Growth	-.24	Intellectual Growth	-.32
	Artistic Performance	-.20	Artistic Performance	-.16
	Congruence with the College	-.19	Congruence with the College	-.18
	Cognitive Proficiency	-.27		

[1]The six groups are:
Soft-Nonlife-Pure (Humanities)
Soft-Life-Pure (Social Sciences)
Soft-Nonlife-Applied(Economics & Operations Research)
Hard-Nonlife-Pure (Physical Sciences)
Hard-Life-Pure (Biological Sciences)
Hard-Nonlife-Applied(Engineering & Applied Sciences, Computer Science, Statistics)

[2]Ratings on dimensions in response to question: "How much would you use the category to differentiate 'Most Successful' undergraduates from other students?"

[3]Ratings on dimensions in response to question: "How much would you use the category to differentiate 'Least Successful' undergraduates?"
The signs of the coefficients have been reversed here and in Figure 3 to parallel the Ideal Success and Real Use ratings.

Table 4

t-Tests Comparing Ideal Use of Criterion Dimensions by Soft and Hard Department Faculty

Criterion Dimensions	For Evaluating Student Success[1]			For Evaluating Student Nonsuccess[2]		
	Soft	Hard		Soft	Hard	
	$\bar{X}$	$\bar{X}$	t-Value	$\bar{X}$	$\bar{X}$	t-Value
General Academic Dimensions						
Intellectual Growth	4.16	4.02	0.76	4.10	3.84	1.34
Cognitive Proficiency	3.79	3.83	-0.34	3.40	3.41	-0.06
Communication Proficiency	4.15	3.80	2.47*	3.84	3.57	1.81
Intellectual Persp. & Curiosity	4.15	4.13	0.12	3.78	3.61	1.21
Creative Performance	4.28	4.56	-1.87	3.64	3.81	-0.77
Academic Effort & Achievement	3.91	3.86	0.46	3.61	3.53	0.60
Self-Directed Behavior	3.83	3.94	-0.72	3.55	3.64	-0.66
Career Goals	3.21	3.49	-1.69	3.07	3.09	-0.13
Specific Academic Dimensions						
Mathematical Proficiency	2.54	3.49	-4.66***	2.30	3.05	-3.47***
Foreign Language Proficiency	3.08	2.28	3.61***	2.52	2.05	2.23*
Artistic Performance	2.53	2.22	1.50	2.26	2.08	0.97
Personal Dimensions						
Personal Growth	3.66	3.42	1.18	3.72	3.23	2.32*
Optimistic, Emotionally Stable	2.93	3.06	-0.91	3.05	3.04	0.09
Ethical Behavior	3.71	3.63	-0.44	3.63	3.45	0.95
Athletic Performance	1.49	1.83	-2.33*	1.53	1.85	-2.14*
Interpersonal Dimensions						
Participation in Organizations	2.43	2.56	-1.10	2.49	2.60	-0.84
Interpersonal Sociability	2.69	2.81	-0.85	2.77	2.80	-0.24
Interpersonal Responsiveness	2.99	2.98	0.04	2.99	2.93	0.04
Discrimination Issues Behavior	2.19	2.07	0.72	2.10	2.07	0.19
Institutional Dimensions						
Congruence with the College	3.23	3.00	1.51	3.37	3.10	1.73
Persistence toward Graduation	2.44	2.50	-0.23	2.64	2.72	-0.27

[1] Ratings on dimensions in response to question: "How much would you use the category to differentiate 'Most Successful' undergraduates from other students?" (Scale=1-5)

[2] Ratings on dimensions in response to question: "How much would you use the category to differentiate 'Least Successful' undergraduates?" (Scale=1-5)

***=$p<.001$

*=$p<.05$